IDS-5

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DERWENT-WEEK: 199918

TITLE: Cooling of pumpable liq. with or without particles, partic. food prods. - by contacting with compressed liquefied gas, partic. carbon di:oxide, and sepg. off gas

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PATENT-ASSIGNEE: SIVIK, B SIVIK B[SIVII] , TETRA LAVAL HOLDINGS & FINANCE SA [TETR]

PRIORITY-DATA: 1994SE-0004499 (December 23, 1994)

PATENT-FAMILY:

PUB-NO	PUB-DATE	LANGUAGE	PAGES	MAIN-IPC
WO 9619922 A1	July 4, 1996	E	017	A23D 007/05A23B 007/05A23B 007
SE 509920 C2	March 22, 1999	N/A	000	/05A23D 007/05
SE 9404499 A	June 24, 1996	N/A	000	
AU 9643601 A	July 19, 1996	N/A	000	

DESIGNATED-STATES: AU BR CA CN FI HU JP KR MX NO NZ PL US AT BE CH DE DK ES FR GB GR IE IT LU MC NL PT SE

CITED-DOCUMENTS: DE 864355; US 4000332 ; US 4217372 ; US 4267015 ; US 4362758 ; WO 9106220 ; WO 9208363

APPLICATION-DATA:

PUB-NO	APPL-DESCRIPTOR	APPL-NO	APPL-DATE
WO 9619922A1	N/A	1995WO-SE01556	December 21, 1995
SE 509920C2	N/A	1994SE-0004499	December 23, 1994
SE 9404499A	N/A	1994SE-0004499	December 23, 1994
AU 9643601A	N/A	1996AU-0043601	December 21, 1995
AU 9643601A	Based on	WO 9619922	N/A

INT-CL (IPC): A23B007/05, A23C015/02 , A23C015/16 , A23D007/05 , A23L003/36 , A23L003/375 , F25B009/00 , F28C003/08 , F28F003/08

ABSTRACTED-PUB-NO: WO 9619922A

BASIC-ABSTRACT:

Cooling pumpable liq. with or without particles comprises contacting it with a flow of condensed gas in conditions such that the gas is evaporated. The cooling is pref. continuous with the gas flow (3) directed into a liquid flow (1) and vaporised gas removed in two successive separation chambers (4,7), and then compressed (11,15) and condensed for re-use. In partic. the liq. is a fat emulsion for prodn. of spreadable fat, or is a food mixt. with particulate material, and the gas is CO2. The appts. is also claimed and has a contact zone (2) of limited vol. in an expansion valve or expansion chamber connected to a sepn. chamber.

USE - The method is used for cooling fat emulsion or e.g. fruit or vegetables in their own juice such as tomato cubes in juice, or meat or fish pieces in a sauce.

ADVANTAGE - Cooling is rapid and efficient.

CHOSEN-DRAWING: Dwg.1/1

TITLE-TERMS: COOLING PUMP LIQUID PARTICLE FOOD PRODUCT CONTACT COMPRESS LIQUEFY GAS CARBON DI OXIDE SEPARATE GAS

DERWENT-CLASS: D13 Q75 Q78

CPI-CODES: D02-A03; D03-H01L; D03-K03;

SECONDARY-ACC-NO:
CPI Secondary Accession Numbers: C1996-102337
Non-CPI Secondary Accession Numbers: N1996-270674

PUB-NO: WO009619922A1

DOCUMENT-IDENTIFIER: WO 9619922 A1

TITLE: METHOD AND ARRANGEMENT FOR COOLING OF A PUMPABLE LIQUID WITH OR WITHOUT PARTICLES

PUBN-DATE: July 4, 1996

INVENTOR-INFORMATION:

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ASSIGNEE-INFORMATION:

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SIVIK BJOERN		

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INT-CL (IPC): A23D007/05 , A23C015/02 , A23C015/16 , F28C003/08

EUR-CL (EPC): A23D007/05 , A23L003/36 , A23L003/375 , F25B009/00 , F28C003/08

ABSTRACT:

CHG DATE=19990617 STATUS=O>Cooling of a pumpable liquid with or without particles is obtained in that a flow of a condensed gas is supplied to a flow of said liquid during such conditions that the condensed gas is evaporated. The evaporation heat is taken from said liquid which owing to that is cooled momentary. The cooling is carried through in an arrangement comprising an inlet for condensed gas and an inlet for a pumpable liquid with or without particles which both inlets lead to a zone with a limited volume in order to cause momentary contact between condensed gas and said liquid.

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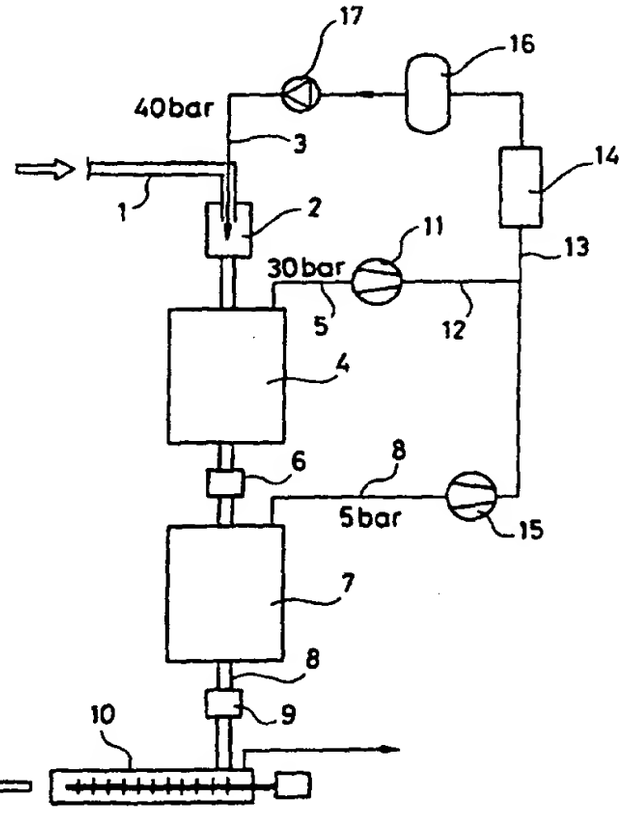
(54) Title: METHOD AND ARRANGEMENT FOR COOLING OF A PUMPABLE LIQUID WITH OR WITHOUT PARTICLES

(57) Abstract

Cooling of a pumpable liquid with or without particles is obtained in that a flow of a condensed gas is supplied to a flow of said liquid during such conditions that the condensed gas is evaporated. The evaporation heat is taken from said liquid which owing to that is cooled momentary. The cooling is carried through in an arrangement comprising an inlet for condensed gas and an inlet for a pumpable liquid with or without particles which both inlets lead to a zone with a limited volume in order to cause momentary contact between condensed gas and said liquid.



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NSDOCID: <WO___9619922A1_I_>

Method and arrangement for cooling of a pumpable liquid with our without particles

The present invention relates to a method of cooling of a pumpable liquid with or without particles and an arrangement for carrying trough the cooling.

It is known to cool liquids with or without particles batchwise in different cooling arrangements as cooling tanks with immersion coolers or cooling jackets.

Continuous cooling of pumpable liquids usually takes place by means of indirect heat exchange in such a way that the liquid is brought to pass a heat exchanger where it is cooled by cooling media. For easily flowing liquids the cooling may take place in tubes or plate heat exchangers, while heat exchangers provided with scrapers are used for more viscous or particle-containing liquids.

The cooling in the different indirectly working cooling means will necessarily be relatively slow since only a part of the liquid gets in direct contact with the cooled surfaces.

According to the invention there is now proposed a method for rapid and efficient cooling of a pumpable liquid with or without particles. The method according to the invention is mainly characterized in that a flow of condensed gas is supplied to an amount of said liquid under such conditions that the condensed gas is evaporated, at which the evaporating heat is taken from said liquid, which by reason of that is cooled momentary. A batch of liquid may be cooled in this way.

If the cooling should be carried through continuously the flow of condensed gas is directed into a flow of said liquid.

The gas which is formed during the evaporation is separated from said liquid for example in a separating chamber.

The liquid with or without particles and the rest of the gas is directed to a second separation chamber according to the invention where the rest of the gas is separated and led away from the liquid with our without particles.

By the fact that the gas is taken away in two steps the separation between the gas and the liquid with or without particles will be more effective.

The separated gas is with advantage compressed and condensed to be used again as a cooling medium.

The method according to the invention is especially suitable if the liquid with or without particles is used for production of food at which the used gas is approved for food purposes. Carbon dioxide is preferably used as such a gas.

The method is especially useful if liquid with or without particles consists of a viscous liquid which is difficult to cool.

The method according to the invention is especially suitable when the liquid consists of fat emulsion intended for production of a spreadable fat.

When the said liquid consists of a food mixture comprising particulate material important advantages are also obtained. As an example of such mixtures there may be mentioned fruit or vegetable mixtures in its own juice or sap as for example cubes of tomato in juice. The mixture may also consist of meat or fish pieces in a sauce.

An arrangement for carrying through the method for cooling according to the invention comprises mainly an inlet for condensed gas and an inlet for pumpable liquid with or without particles, which inlets both lead to a zone with a limited volume in order to obtain a momentary contact between the condensed gas and the liquid with or without particles.

As an alternative to this way of converging the flows it is of course also possible to divide both flows such that a small flow of condensed gas is mixed with a little amount of liquid, if so should be desired. The important feature is to obtain the momentary contact between the flows.

This zone may with advantage be arranged in an expansion valve or in an expansion chamber connected to a separation chamber.

Said separation chamber may by way of a conduit be connected to a compressor for compression of the gas.

According to the invention said separation chamber is suitably connected to a further separation chamber which further chamber has an outlet which is connected to a second compressor.

At least one of the compressors is with advantage connected to a condenser by way of a conduit which condenser in its turn is connected to a storage tank for condensed gas by way of a further conduit from which tank the condensed gas is recirculated for repeated evaporation.

According to the method of the invention a condensed gas is brought to evaporate in a pumpable liquid with or without particles. By the fact that the condensed gas almost immediately is evaporated, there is obtained a very rapid cooling of the pumpable liquid. The gas to be chosen depends of course on the intended application and its demand for cooling and on the costs which the cooling step may carry. If a more exclusive product shall be rapidly cooled from for example a certain treatment or mixing temperature at or slightly above the room temperature, ethene, Freon or CO_2 may be used. If the cooling takes place at higher temperatures some other gas for example propane, ethane or N_2O, which condenses at a higher temperature is used.

If the pumpable liquid with or without particles shall be used for production of a food product the gas must be approved for food. As such gas carbon dioxide is preferred even if it is possible to work for example with nitrogen if so should be desired. Carbon dioxide condenses at different temperatures depending on the pressure. Accordingly, the condensation temperature is -30°C at 14 bar, -0°C at 35 bar and 25°C at 60 bar. Working with higher pressure than 40 bar usually makes the process more expensive in an unnecessarily high degree.

In order to make the contact between the condensed gas and the liquid which shall be cooled as intensive as possible, both condensed gas and liquid is supplied to a zone with a limited volume for example in such a way that condensed gas is supplied to the liquid by way of an inlet leading directly into a flow of said liquid. Immediately after the mixing the condensed gas is evaporated with a corresponding increase in volume and the said zone must consequently be connected to a space with a larger volume. The temperature of the liquid is lowered directly. As a consequence of the decrease in pressure and the expansion, the liquid is during this rapid course also exposed to a mechanic treatment as a consequence of the high shear forces which are developed. In the separation chamber a pressure decrease takes place and a part of the gas is removed.

The invention is described further with reference to the attached drawing which schematically shows an embodiment of an arrangement for cooling of a fat emulsion chosen as an example.

A flow of fat emulsion with a temperature of 35°C is directed to an evaporating chamber 2 by way of a conduit 1. To the chamber there is also directed a flow of condensed gas by way of a second conduit 3. The condensed gas, which consists of CO_2 has a pressure of 40 bar. When the condensed gas enters the expansion chamber and is brought together with the fat emulsion it is immediately evaporated with a simultaneous cooling of the fat emulsion. Formed gas and emulsion are then directed further to a separation chamber 4 where a decrease in pressure takes place. The largest part of the CO_2 gas which is set free is directed away by way of a conduit 5 with a pressure of 30 bar. The mixture of

fat emulsion and the rest of the gas is, due to the gravity and the pressure in the chamber 4, brought to pass a second means 6, which only allows flow in one direction into a second chamber 7. In this second chamber 7 there is a further decrease in pressure such that carbon dioxide gas which is set free leaves the chamber with a pressure of 5 bar through a conduit 8. The fat emulsion is brought to pass a further means 9 before it is led to a working unit 10 with a temperature of about 10°C for example to a pin rotor prior to a following packaging. The means 6 and 9 may consist of pumps or valves which function as locks which separate the separation chambers from each other and from the following working unit. Carbon dioxide gas may also be led away from the working unit 10.

The carbon dioxide gas in the conduit 5 with a pressure of 30 bar is led to a compressor 11 where the pressure is increased to 40 bar. From this the gaseous carbon dioxide is led through a conduit 12, 13 to a condenser 14. The compressed gaseous carbon dioxide from the conduit 8 is also directed to the condenser. This gas has been compressed in a compressor 15. In the condenser the temperature is lowered to below 4°C, which results in condensation of the gas. From the condenser the condensed carbon dioxide is directed to a storage vessel 16 which functions as a balance vessel. The amount of carbon dioxide which is needed for the cooling is withdrawn from the storage vessel 16 and passes a pump 17 which supplies the condensed gas at a pressure of for example 40 bar. The condensed gas is mixed with new fat emulsion, is evaporated again and is partly removed through the conduit 5.

The cooling of the fat emulsion takes place continuously and the carbon dioxide changes state of aggregation cyclically.

In the shown embodiment there are used two chambers where the main part of the evaporated carbon dioxide gas is removed from the first chamber, the separation chamber. If so is considered desirable only one common chamber with one outlet for gas may be used. If only one outlet of gas is used the pressure of the CO_2 gas is low which makes degassing of fat emulsion easier but the process will be more expensive.

In the shown embodiment condensed carbon dioxide with a pressure of 40 bar has been used for the cooling.

The values of the gas pressure which are shown on the drawing only represent examples of a pressure level which is usable for the invention. Many other alternatives are possible also at pressures over 40 bar where different combinations of pressure and temperature of the condensed gas with values over 40 bar/4°C may be used.

If the removed carbon dioxide is compressed to a higher pressure a smaller cooling area in the condenser is needed than if the pressure is lower.

An arrangement of the described kind presents large advantages in relation to earlier known technique where scraped-surface heat exchangers have taken care of the cooling. If some problem should arise at the packaging the feed of fat emulsion and condensed carbon dioxide to the evaporation chamber is interrupted. When the problem has been solved, often only some minute later, the

feeding starts again and the cooling process continues. A corresponding interruption in a plant with scraped-surface heat exchanger may result in total stop of the operation. Only after cleaning a re-start may be possible.

Within the scope of the invention it is possible to use as well other gases approved for food, if the pumpable liquid with or without particles consists of a food product or shall be treated further to such a product, as other kinds of gases with suitable condensation temperatures for other types of liquids.

Claims

1. Method for cooling of a pumpable liquid with or without particles, characterized in that a flow of condensed gas is directed to an amount of said liquid during such conditions that the condensed gas is evaporated, at which the evaporation heat is taken from the liquid with or without particles which liquid owing to, that is cooled momentary.

2. Method according to claim 1, characterized in that the cooling takes place continuously by directing the flow of condensed gas into a flow of said liquid.

3. Method according to claim 2, characterized in that the gas which is formed during the evaporation is separated from said liquid in a separation chamber.

4. Method according to claim 1-3, characterized in that said liquid and the rest of the gas are directed to a second separation chamber where the remaining gas is separated and removed from said liquid.

5. Method according to claim 4, characterized in that the separated gas is compressed and condensed in order to be used again as a cooling medium.

6. Method according to any one of the preceding claims, characterized in that said liquid is used for production of a food and in that the used gas is approved for food.

7. Method according to claim 6, c h a r a c t e - r i z e d i n that the gas consists of carbon dioxide.

8. Method according to claim 1-7, c h a r a c t e - r i z e d i n that the said liquid consists of a fat emulsion intended for production of a spreadable fat.

9. Method according to claim 1-7, c h a r a c t e - r i z e d i n that said liquid consists of a food mixture comprising particulate material.

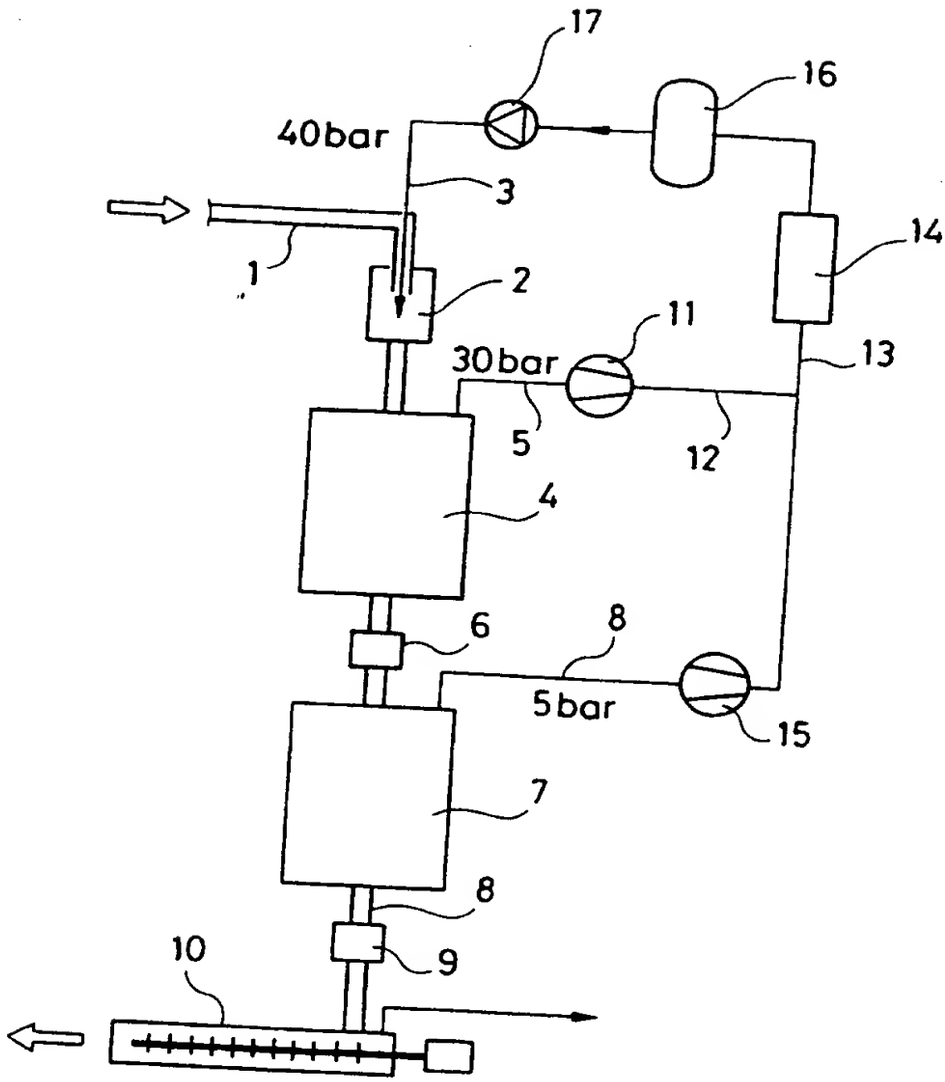
10. Arrangement for carrying through the method for cooling according to claim 1, c h a r a c t e - r i z e d i n that the arrangement comprises an inlet for condensed gas and an inlet for pumpable liquid with or without particles, which inlets both lead to a zone with limited volume in order to create a momentary contact between condensed gas and said liquid.

11. Arrangement according to claim 10, c h a r a c - t e r i z e d i n that said zone is arranged in an expansion valve or in an expansion chamber (2) connected to a separation chamber (4).

12. Arrangement according to claim 10-11, c h a - r a c t e r i z e d i n that the separation chamber (4) is connected to a compressor (11) for compressing of the gas by way of a conduit.

13. Arrangement according to claim 10-12, c h a - r a c t e r i z e d i n that the said separation chamber (4) is connected to a further separation chamber (7), which further chamber also has an outlet for gas which is connected to a second compressor (15).

14. Arrangement according to claim 12 or 13, c h a - r a c t e r i z e d i n that at least one of the compressors is connected to a condenser (14) by way of a conduit, which in its turn is connected to a storage tank (16) for condensed gas by way of a further conduit from which tank the condensed gas is recirculated for repeated evaporation.



INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE 95/01556

A. CLASSIFICATION OF SUBJECT MATTER

IPC6: A23D 7/05, A23C 15/02, A23C 15/16, F28C 3/08
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC6: A23C, A23D, A23L, A01J, F28C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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A	US 4362758 A (MACNEILL ET AL), 7 December 1982 (07.12.82), column 2, line 37 - line 52	1-13
A	US 4000332 A (STRINNING ET AL), 28 December 1976 (28.12.76), column 5	1-13
A	US 4267015 A (CIBOIT ET AL), 12 May 1981 (12.05.81)	1-13

[X] Further documents are listed in the continuation of Box C. [X] See patent family annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
28 March 1996	02 -04- 1996
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INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE 95/01556

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

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INTERNATIONAL SEARCH REPORT

Information on patent family members

05/02/96

International application No.
PCT/SE 95/01556

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